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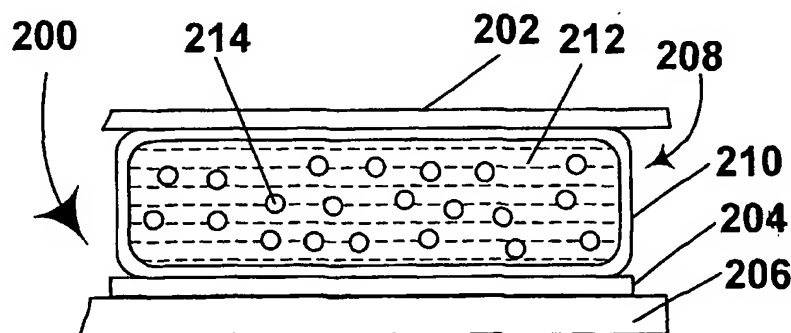
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[Continued on next page]

(54) Title: **ELECTROPHORETIC DISPLAYS USING NANOPARTICLES**



(57) Abstract: An electrophoretic display (200) comprises a fluid (212) and a plurality of nanoparticles (214) having diameters substantially less the wavelengths of visible light such that, when the nanoparticles (214) are in a dispersed state and uniformly dispersed throughout the fluid (212), the display (200) presents a first optical characteristic, but when the nanoparticles (214) are in an aggregated state in which they are gathered into aggregates substantially larger than the individual nanoparticles, the display (200) presents a second, different optical characteristic. The display (200) further comprises at least one electrode (202, 204) arranged to apply an electric field to the nanoparticle-containing fluid (212) and thereby move the nanoparticles (214) between their dispersed and aggregated states. Various compound particles comprising multiple nanoparticles, alone or in combination with larger objects, and processes for the preparation of such compound particles, are also described.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 01/50845

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G02F1/167

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, WPI Data, COMPENDEX, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | US 6 067 185 A (ALBERT JONATHAN D ET AL) 23 May 2000 (2000-05-23) | 1-3 |
| A | column 9, line 23 -column 10, line 4; figure 9 | 4-29 |
| | --- | |
| X | WO 99 60554 A (MASSACHUSETTS INST TECHNOLOGY) 25 November 1999 (1999-11-25) | 1-3 |
| A | page 2, line 25 -page 3, line 8 | 4-29 |
| | --- | |
| | -/-- | |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
 "&" document member of the same patent family

Date of the actual completion of the international search

19 June 2002

Date of mailing of the international search report

30/08/2002

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INTERNATIONAL SEARCH REPORT

Internal Application No
PCT, 91/50845

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | ELGHANIAN R ET AL: "SELECTIVE COLORIMETRIC DETECTION OF POLYNUCLEOTIDES BASED ON THE DISTANCE-DEPENDENT OPTICAL PROPERTIES OF GOLD NANOPARTICLES" SCIENCE, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,, US, vol. 277, 22 August 1997 (1997-08-22), pages 1078-1081, XP002916633 ISSN: 0036-8075 the whole document ----- | 1-29 |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/50845

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-29

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-29

The subject-matter of claims 1-19 concerns the definition of the various structural features of an electrophoretic display.

2. Claims: 30-49

The subject-matter of claims 30-49 concerns a nanoparticle assembly and a process for forming a nanoparticle assembly.